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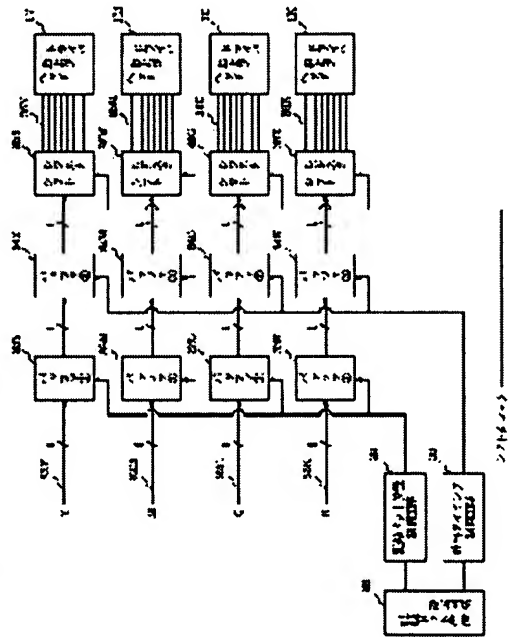
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(54) RECORDING DEVICE

(57)Abstract:

PURPOSE: To record images always excellently by providing a control means for controlling storing position of an image signal in a storage means according to information of information setting means corresponding to drift quantity of dot position.

CONSTITUTION: A circuit 28 for correcting record dot position of each color, for example, can set and input a correction value of the record dot position at 1 dot unit with respect to the vertical scanning direction or horizontal scanning direction at every color by a DIP switch or a key of an operating section. A circuit 29 for controlling the record dot position by a set value of the record dot position setting circuit 28 and a circuit 30 for correcting discharge timing of ink in accordance with the set value of the record dot position setting circuit 28 and interval of record dots of each color are provided. The position setting circuit 28 controls storing position based on the set value when image data in receive buffers 33K, 33C, 33M, 33Y of the position control circuit 29 is to be stored in record buffers 34K, 34c, 34M, and 34y.



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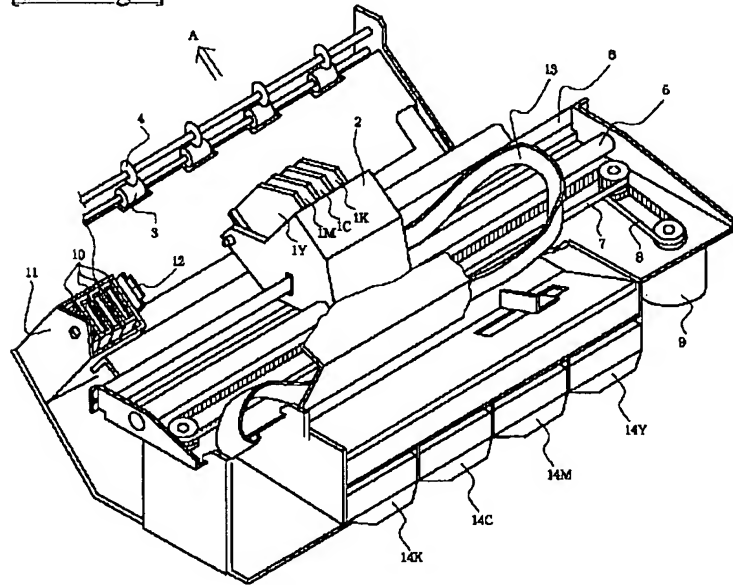
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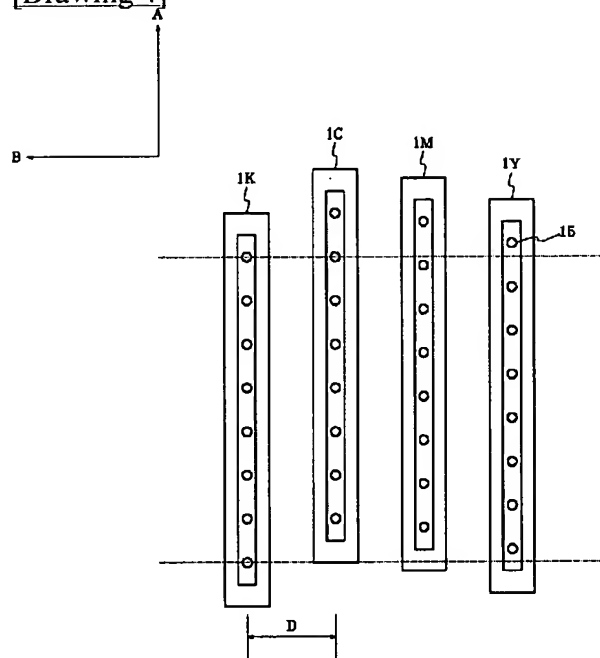
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DRAWINGS

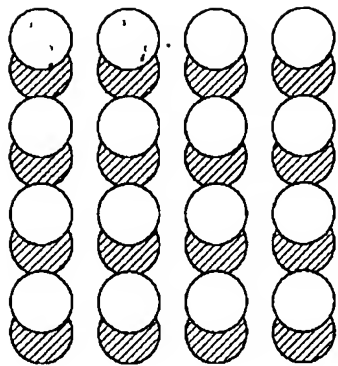
[Drawing 1]



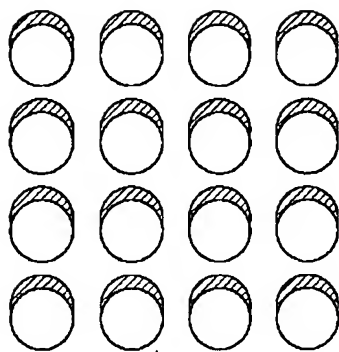
[Drawing 4]



[Drawing 5]

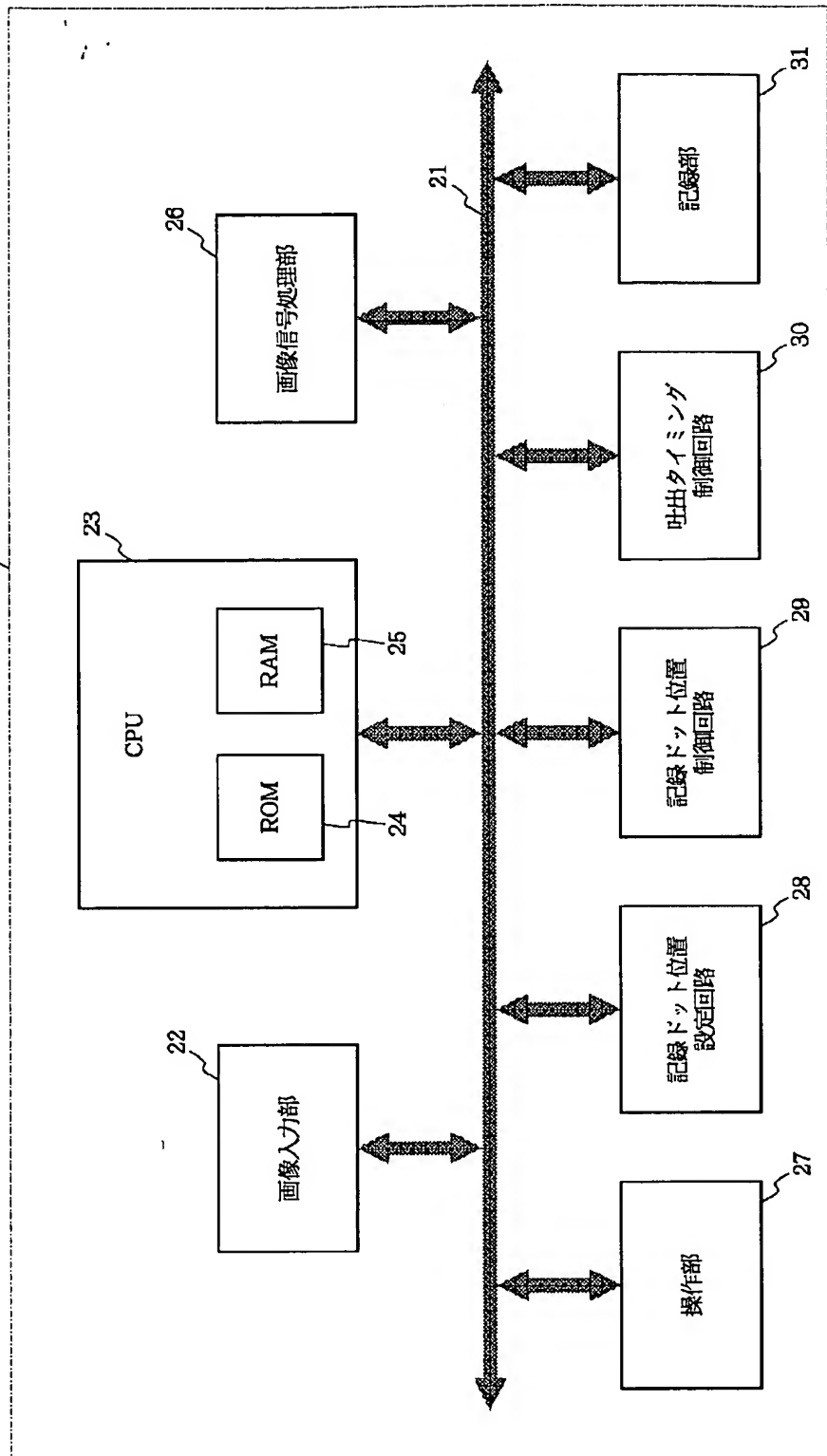


(a)

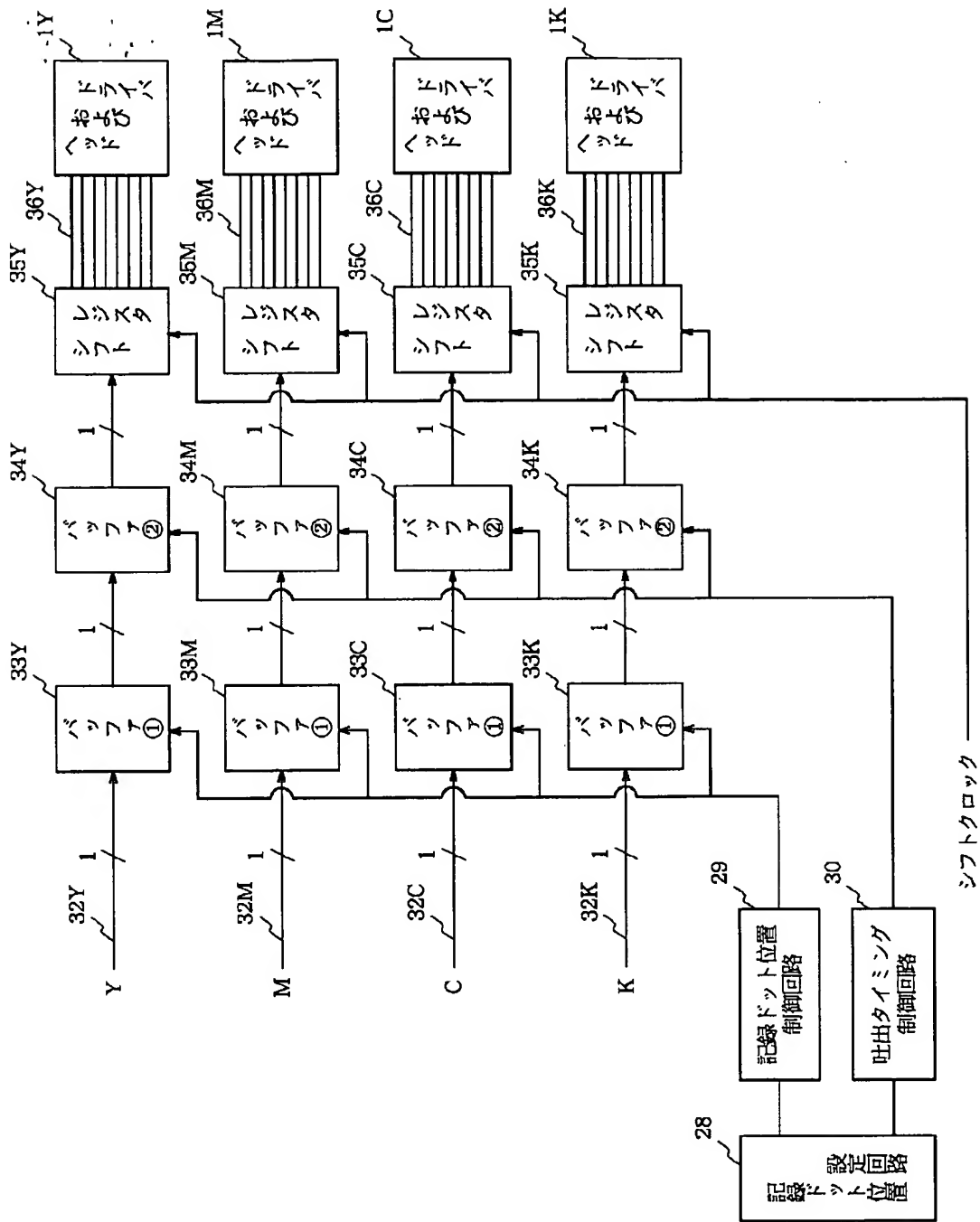


(b)

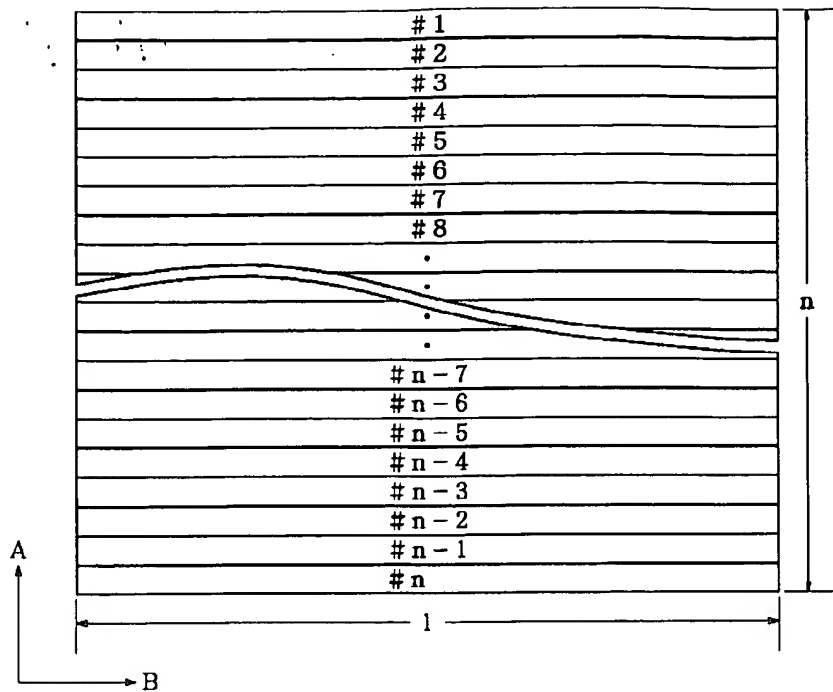
[Drawing 2]



[Drawing 3]

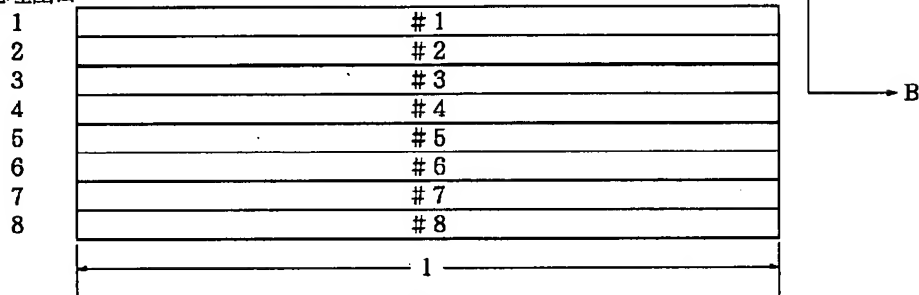


[Drawing 6]

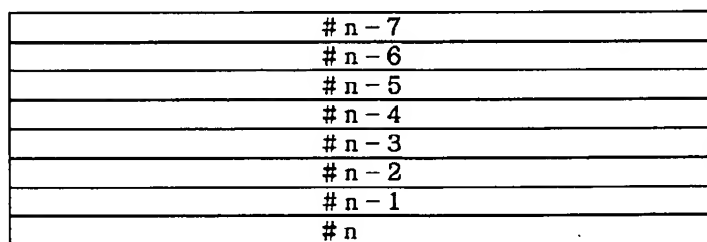


[Drawing 7]

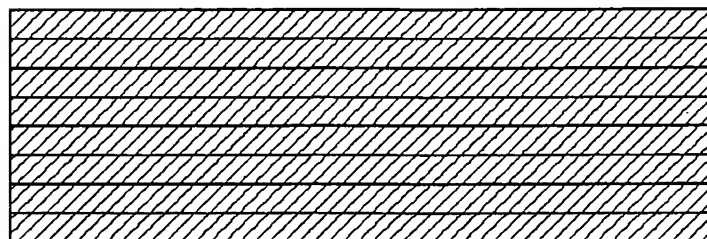
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(a)

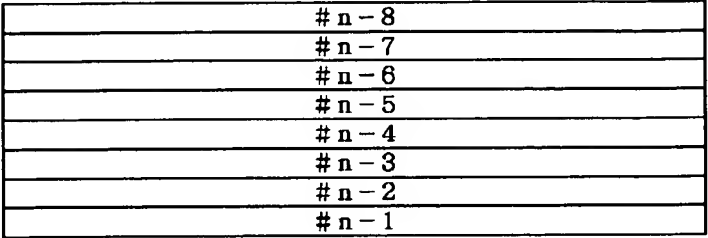
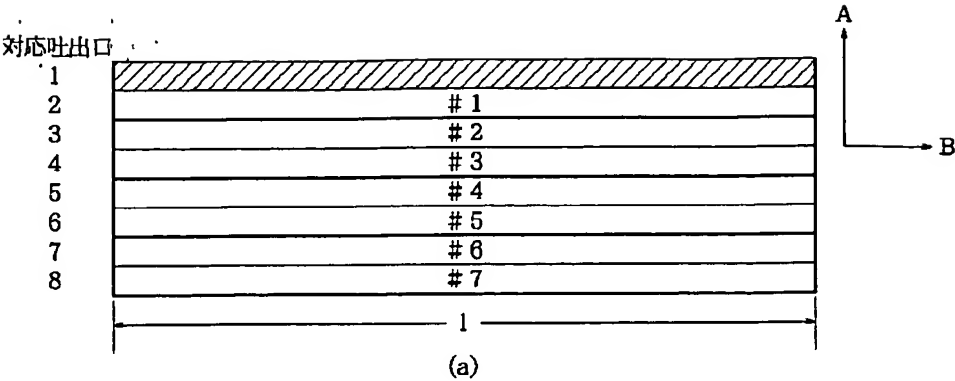


(b)

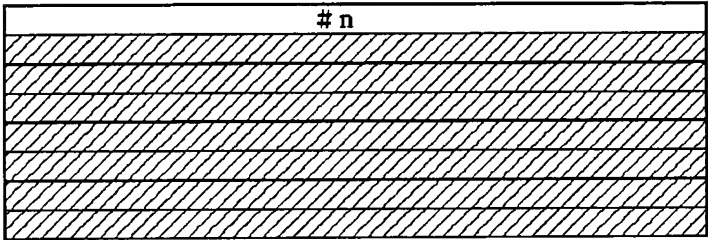


(c)

[Drawing 8]

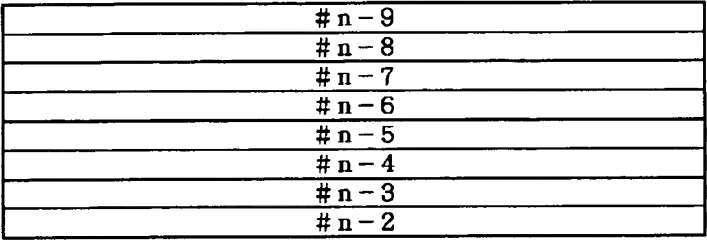
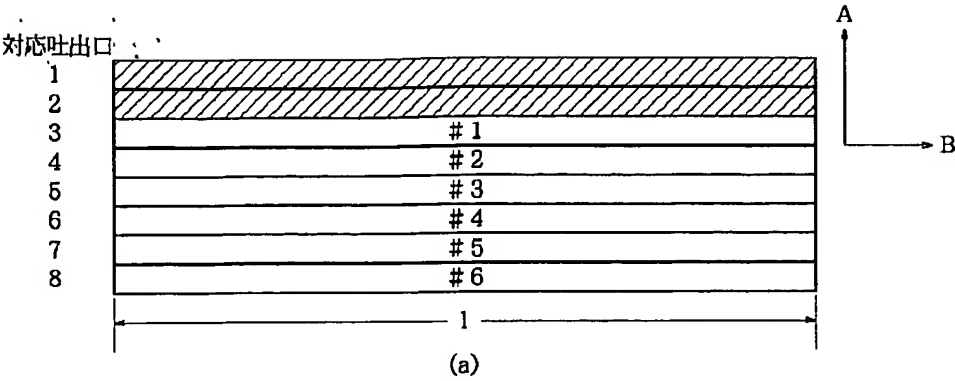


(b)

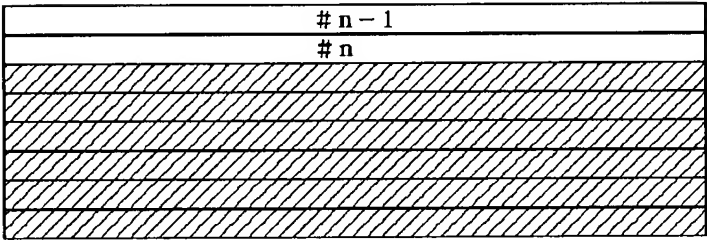


(c)

[Drawing 9]

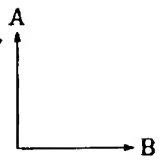


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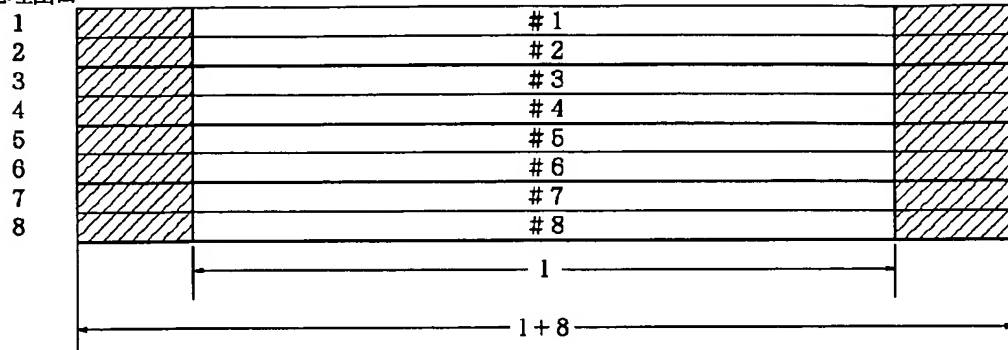


(c)

[Drawing 10]

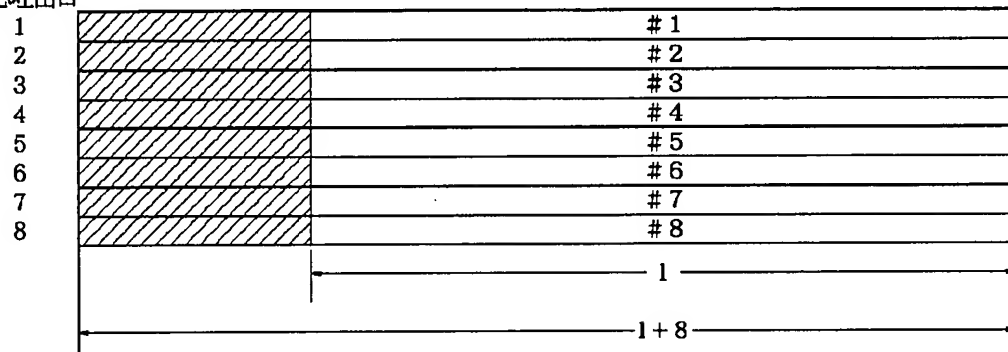


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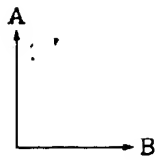
(a)

对应吐出口

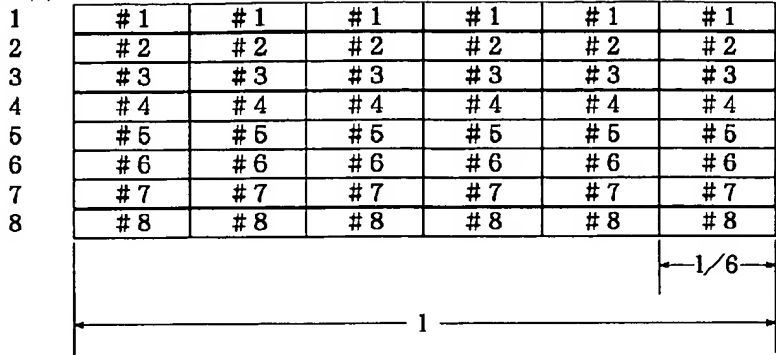


(b)

[Drawing 11]

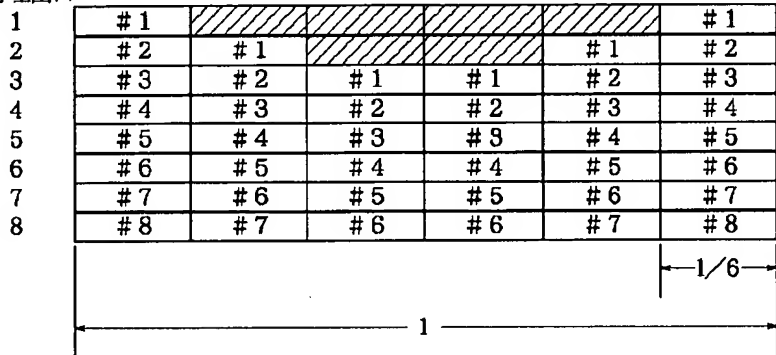


对应吐出口



(a)

对应吐出口



(b)

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the recording device which records an image on record material using the record means equipped with two or more record components.

[0002]

[Description of the Prior Art] Generally, recording apparatus, such as a printer, a copying machine, and facsimile, are constituted so that the image which consists of a dot pattern on the recorded material of the shape of a sheet, such as paper and plastics sheet metal, may be recorded based on image information. Said recording apparatus can be divided into an ink jet type, a wire dot type, a thermal type, a laser beam type, etc. by the recording method, and the ink jet type of them (ink jet recording apparatus) is constituted so that it may record on a recorded material by making ink breathe out.

[0003] an ink jet recording device can record a high definition image at high speed, since it is a non impact method, there is little noise, and it is easy to record a color picture moreover using multicolor ink -- etc. -- it has the advantage. [0004] Based on image information, the above-mentioned ink jet recording device which records by making ink fly to a recorded material is used by preference in the printer by which the silence of a sound of operation is demanded, facsimile, a copying machine, etc. from the delivery of an ink jet recording head. Since especially the ink jet recording device of the method which heats ink locally with the heat energy by the heater element (heater), is made to cause pressure variation inside a delivery with the heated air bubbles, and performs the ink regurgitation has the advantage which can perform the ink regurgitation by the RF, they are put in practical use recently and adopted as the Records Department of each model. [many]

[0005]

[Problem(s) to be Solved by the Invention] However, in the conventional recording device mentioned above, the record dot location of each color shifted from the ideal location with the precision on manufacture of the body of equipment, and a recording head, and there was a problem to which the grace of a record image becomes a cause and a color gap or the fall of resolution falls [grace].

[0006] High resolution-ization progressed especially in recent years, and while the precision which is several microns is required, in order to call for the cheap recording device which a recording head can exchange easily and to raise manufacture top precision, there was a problem also in cost.

[0007] Although record dot location amendment of a recording head scanning direction was still more possible by carrying out adjustable [of the regurgitation timing] electrically in the recording device of serial scan form, the record dot location precision of the record-medium conveyance direction was influenced by the precision like each part of equipment.

[0008] Moreover, it was influenced in the recording apparatus of the Rhine form by the precision like each part of record dot location precision mist beam equipment of the direction of a delivery train of a full multi-type recording head.

[0009] This invention was made in view of the point describing above, and the place made into the purpose is to offer the recording device which can perform always good image recording.

[0010]

[Means for Solving the Problem and its Function] Namely, this invention is set to the recording device which records an image on record material using the record means equipped with two or more record components corresponding to two or more colors. A setting means to set up the information according to the amount of gaps of the dot location on the record material recorded by a storing means to store the picture signal of each color, and the record component of each color, It is characterized by having the control means which controls the storing location to said storing means of said picture signal according to the information set up by said setting means.

[0011] This controls the storing location of the picture signal storing means against a storing means based on the

information set up according to the amount of gaps of a dot location.

[0012]

[Example]

(Example 1) With reference to a drawing, this invention is hereafter explained to a detail.

[0013] Drawing 1 is the perspective view showing the important section configuration of the color ink jet recording device of the serial scan form in the example of this invention. In drawing, recording head 1K which carry out the regurgitation of recording head 1C and the color ink of black which carry out the regurgitation of recording head 1M and the color ink of cyanogen which carry out the regurgitation of recording head 1Y which carries out the regurgitation of the color ink of yellow, and the color ink of a Magenta keep predetermined distance from carriage 2, and are installed in it. the record medium which consists of a form or plastics sheet metal should pass a conveyance roller (un-illustrating) -- it is pinched by the delivery rollers 3 and 4 and is sent in the direction of arrow-head A with the drive of a non-illustrated conveyance motor.

[0014] Guidance support of the carriage 2 is carried out by the guide shaft 5 and the encoder 6.

[0015] Carriage 2 is made to carry out both-way migration along with said guide shaft 5 through driving belts 7 and 8 by the drive of the carriage motor 9. Two or more deliveries are established in the front face (delivery forming face) which meets the record medium of the above-mentioned recording heads 1Y, 1M, 1C, and 1K, and the heater element (the electrical and electric equipment and heat energy conversion object) which generates the heat energy for ink regurgitation is prepared in the interior of each delivery (passage). According to the reading timing of an encoder 6, said heater element is driven based on a record signal, and an image can be formed by making a liquid ink drop fly and adhere to the order of black, cyanogen, a Magenta, and yellow on a record medium.

[0016] Outside the record section, it has the cap section 10 at the home position of carriage 2, and the recovery unit 11 which can perform regurgitation recovery action is arranged.

[0017] 12 is a cleaning blade for cleaning the delivery forming face of a recording head 1. Ink supply to a recording head 1 is performed from the ink tank 14 through the ink supply tube 13 through the subtank which is not illustrated on carriage 2.

[0018] Drawing 2 is the block diagram showing the configuration of the recording apparatus in the example of this invention. 20 shows the recording device, and 22 is the image input section which inputs a picture signal, and inputs the picture signal (each color of 1 bit) of four colors of Black K, Cyanogen C, Magenta M, and Yellow Y in this example.

[0019] 23 shows CPU which controls the recording device 20 whole based on the various programs in ROM24. ROM which stores the program for 24 to operate a control program, an error-processing program, and CPU23 in this CPU23 etc. is shown, and 25 shows RAM used as the work area of the various programs in ROM24, and momentary evacuation area at the time of error processing. And 26 shows the picture signal processing section which performs signal processing of the input picture signal acquired in the image input section 22, and 27 shows the control unit for performing operation, such as printing initiation. 28 is the circuit which carries out an amendment setup of the record dot location of each color, for example, a setting input is possible for it in the correction value of a record dot location per 1 dot to the direction of vertical scanning, or a main scanning direction for every color by the key on a DIP switch or a control unit etc. 29 is a circuit which controls a record dot location by the set point of the record dot location circuit 28. 30 is a circuit which carries out amendment control of the regurgitation timing of ink according to the set point of the record dot location circuit 28, and spacing of the recording head of each color.

[0020] 31 shows the Records Department which forms a discharge image in record material for ink by each recording head (it is equivalent to 1K, 1C, 1M, and 1Y of drawing 1) of four colors of Black K, Cyanogen C, Magenta M, and Yellow Y.

[0021] 21 shows the bus line which transmits the address signal of the recording apparatus 20 interior, a control signal, and data.

[0022] Drawing 3 is the block diagram showing the head control circuit in the picture signal processing section 26 in this example, and the Records Department 31.

[0023] 32K, 32C, 32M, and 32Y are the picture signals of Black K, Cyanogen C, Magenta M, and Yellow Y, respectively.

[0024] 33K, 33C, 33M, and 33Y are buffer **s (buffer for following reception) which store the received picture signal.

[0025] 34K, 34C, 34M, and 34Y are buffer [for controlling the regurgitation timing of ink] **s (buffer for following record).

[0026] 36K, 36C, 36M, and 36Y are the signals of the black K which can be distributed to the component for making shift registers 35K, 35C, 35M, and 35Y perform the ink regurgitation of each recording heads 1K, 1C, 1M, and 1Y, Cyanogen C, Magenta M, and Yellow Y. In addition, the number of stages of each shift register of shift registers 35K, 35C, 35M, and 35Y is constituted so that it may become the number of the deliveries of each head, and the same number.

[0027] It controls in which location 28 is the aforementioned record dot location circuit, and with this set point, in case

it stores the image data in the buffers 33K, 33C, and 33M for reception of the record dot positioning control circuit 29, and 33Y in the buffers 34K, 34C, and 34M for record, and 34Y, it is stored.

[0028] Drawing 4 is the top view which saw the delivery of each recording head from the transverse plane. 15 is a delivery and each recording heads 1K, 1C, 1M, and 1Y have eight deliveries in this example, respectively.

[0029] It has juxtaposed from the drawing left to Black K, Cyanogen C, Magenta M, and yellow Y. On carriage 2, each recording head is detached distance every D, and is installed. An arrow head A is the conveyance direction (the direction of vertical scanning) of a record medium, and an arrow head B is a direction (main scanning direction) which carriage scans at the time of image recording.

[0030] In drawing 4, the gap has arisen in the center position of a delivery to the direction of vertical scanning between each recording head.

[0031] Drawing 5 is the image recorded with the recording device in this example. Drawing 5 (a) is an image at the time of recording without amending a location gap of the record dot of the direction of vertical scanning in the condition which shows in drawing 4.

[0032] The record dot of the Magenta color on which the dot of a null was recorded by recording head 1M of drawing 4 in drawing 5 (a), and the dot of a slash are record dots of the black color recorded by recording head 1K of drawing 4.

[0033] Being able to record the recording head of this example in the resolution of 360DPI, the pitch between each delivery 15 is 70.5 micrometers.

[0034] The record dot (dot of a null) of a Magenta color and the record dot (dot of a slash) of a black color in drawing 5 (a) have produced about 52.9 micrometers ($3/4$ pitch) gap to the direction of vertical scanning.

[0035] Next, the amendment approach of the record dot location in this example is explained. Drawing 6 is the explanatory view of the picture signal storing condition in the buffer for reception in this example. In drawing 6, an arrow head A is the direction of vertical scanning, and an arrow head B is a main scanning direction at the time of record. The recording apparatus in this example is possible in record of maximum n dot x l dot, and the maximum memory size of the buffer for reception in drawing 6 is $(n \times l) / 8$ (Byte/color), and can store the picture signal for 1 page.

[0036] Drawing 7 is the explanatory view of the picture signal storing condition in the buffer for record in this example. In drawing 7, an arrow head A is the direction of vertical scanning, and an arrow head B is a main scanning direction at the time of record. Since the number of deliveries of a recording head is eight pieces, the maximum memory sizes of the buffer for record are per color $(8 \times l) / 8$ (Byte), and can store the picture signal for one scan.

[0037] Drawing 7 shows the picture signal storing condition when not amending a record dot location.

[0038] Drawing 7 (a) shows the condition that the picture signal of #1-#8 in the buffer for reception of drawing 6 is stored, and supports the 1st - the 8th delivery of a recording head, respectively.

[0039] Drawing 7 (b) shows the condition that the picture signal of #n-7 - #n in the buffer for reception of drawing 6 is stored, and supports the 1st - the 8th delivery of a recording head, respectively. Drawing 7 (c) does not have a picture signal from the buffer for reception, the slash showed that the signals in a buffer were "0" cleared conditions, and gets down, and a dot is not recorded in this condition.

[0040] Drawing 8 is the explanatory view of the picture signal storing condition of the buffer for record corresponding to the Magenta color at the time of amending the record dot location of the direction of vertical scanning of a black color and a Magenta color, when printing using the recording head shown in drawing 4.

[0041] The picture signal storing condition of the buffer for record corresponding to the black color at this time is the same as that of drawing 7.

[0042] In drawing 8 (a), the signal in the buffer memory corresponding to the 1st delivery is "0." Sequential storing of #1-#7 in the buffer for reception of drawing 6 is carried out at the part corresponding to the 2nd - the 8th delivery. The picture signal of #n-8-#n-1 in the buffer for reception of drawing 6 is stored, and drawing 8 (b) supports the 1st - the 8th delivery of a recording head, respectively. The picture signal of #n in the buffer for reception of drawing 6 is stored, and drawing 8 (c) supports the 1st delivery of a recording head. The memory part corresponding to the 2nd - 8th remaining serves as a signal of "0."

[0043] Thus, as shown in drawing 8, the storing location within the record buffer of the picture signal of a Magenta color has relation from which the direction of vertical scanning is caudad shifted by 1 dot to the storing location of the picture signal of the black color shown in drawing 7.

[0044] It is drawing 5 (b) which recorded the again same image as drawing 5 (a) in the state of picture signal storing of drawing 7 and the buffer for record of drawing 8.

[0045] In drawing 5 (b), since the picture signal in the buffer for record corresponding to a Magenta color is caudad shifted by the 1 dot of the directions of vertical scanning to the black color, the amount of gaps of the record dot (dot of a null) of a Magenta color and the record dot (dot of a slash) of a black color was set to about 17.6 micrometers ($1/4$ pitch) by the pitch, and has become less than drawing 5 (a).

[0046] Drawing 9 is a buffer for record in the condition of having shifted the picture signal in the buffer for reception of drawing 6 in the direction lower part of vertical scanning by 2 dots, and having stored it in it. It is possible to also

shift how many dots to the direction lower part of vertical scanning.

[0047] The amount of gaps of a record dot location can be carried out to below about 35.3 micrometers (1/2 pitch) at a dot pitch by carrying out adjustable [of the storing location of the picture signal in the buffer for correspondence record of each color] in the recording head of the ink color caudad set up No. 1 to the direction of vertical scanning, and drawing 4 by making the record dot location of recording head 1K of a black color into a standard.

[0048] In addition, although the buffer for reception had the memory size for 1 page in this example, the memory space of the buffer for record and the size below equivalent are sufficient.

[0049] (Example 2) Other examples in this invention are explained below. In addition, since main configurations are the same as that of a previous example, explanation is omitted here.

[0050] Drawing 10 is the explanatory view of the picture signal storing condition in the buffer for record in this example. In this example, it has composition which also amends location gap of a record dot [not only gap of the array direction (the direction of vertical scanning) of a delivery but further as opposed to the array direction (main scanning direction) of each color head]. In drawing 10 , an arrow head A is the direction of vertical scanning, and an arrow head B is a main scanning direction at the time of record. Since the number of deliveries of a recording head is eight pieces, the maximum memory sizes of the buffer for this record are per color $\{8 \times (1+8)\} / 8$ (Byte).

[0051] In addition to the memory 1Bit of per one raster and a main scanning direction, the buffer for this record has many memory space by 8Bit(s).

[0052] Drawing 10 (a) is in the storing condition of the picture signal in the buffer for record in case the recording head is installed in the location of a standard to the main scanning direction. Sequential storing of the picture signal of #1-#8 in the buffer for reception of drawing 6 is carried out, and the field for main scanning direction left and right-hand side 4Bit serves as "0" signals.

[0053] Drawing 10 (b) is in the storing condition of the picture signal in the buffer for record in case the recording head is shifted and installed in 4-dot (4Bit) part left-hand side to the location of a standard to the main scanning direction and amendment is needed.

[0054] Although sequential storing of the picture signal of #1-#8 in the buffer for reception of drawing 6 is carried out, the field for main scanning direction left-hand side 8Bit serves as "0" signals.

[0055] To drawing 10 (a), the picture signal has shifted to main scanning direction right-hand side by 4Bit(s) within the buffer for record, and, as for drawing 10 (b), an image is recorded on the gap at the time of recording head installation, and a phase murder standard location.

[0056] In this example, it can be used also for the record dot location amendment in the case of the Rhine form which records on record dot location amendment of the main scanning direction in the recording device of serial scan form using the so-called full multi-head which arranged the ink delivery for the cross direction of one line not only of the owner effect but a record medium.

[0057] In addition, gap amendment of the direction of vertical scanning can be performed like the case of a previous example.

[0058] (Example 3) Example another next to the pan in this invention is explained. In addition, since main configurations are the same as that of a previous example, explanation is omitted here. Drawing 11 is the explanatory view of the picture signal storing condition in the buffer for record in this example.

[0059] In drawing 11 , an arrow head A is the direction of vertical scanning, and an arrow head B is a main scanning direction at the time of record. Since the number of deliveries of a recording head is eight pieces, the maximum memory sizes of the buffer for this record are per color $(8 \times 1) / 8$ (Byte). Furthermore, 6 ****s is carried out to the main scanning direction. Drawing 11 (a) is in the storing condition of the picture signal in the buffer for record without amendment. Sequential storing of the picture signal of #1-#8 in the buffer for reception of drawing 6 is carried out like all division blocks.

[0060] Drawing 11 (b) is an example of the storing condition of the picture signal in the buffer for record at the time of amendment. "0" signals are inputted into the division block field of the slash section, and the picture signal of #1-#8 in the buffer for reception of drawing 6 corresponds, and is stored. The picture signal is curved and stored in the concave.

[0061] In amendment of drawing 11 (b), when the guide shaft used as the location standard at the time of carriage scanning etc. is curving to convex, it is effectively amended by counter acting effect.

[0062] As mentioned above, in the explanation mentioned above, although the number of deliveries of a recording head was made into eight pieces for simplification of explanation, it is not limited to this and amendment can be effectively done also in the recording device which has the recording head of many deliveries, such as 64 pieces and 128 etc. pieces.

[0063] Also in the recording device which can furthermore record the high resolution of 400DPI, 600DPI, etc., it can amend effectively.

[0064] (in addition to this) In addition, especially this invention is equipped with means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used also in an ink jet recording

method in order to make the ink regurgitation perform, and brings about the effectiveness which was excellent in the recording head of the method which makes the change of state of ink occur with said heat energy, and the recording device. It is because the densification of record and highly minute-ization can be attained according to this method. [0065] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 specification and the 4740796 specification, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording information and exceeds nucleate boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles in the liquid (ink) corresponding to this driving signal can be formed by one to one as a result, it is effective. A liquid (ink) is made to breathe out through opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If this driving signal is made into the shape of a pulse form, since growth contraction of air bubbles will be performed appropriately instantly, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable. As a driving signal of the shape of this pulse form, what is indicated by the U.S. Pat. No. 4463359 specification and the 4345262 specification is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 specification of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0066] It is contained in this invention of the configuration using the U.S. Pat. No. 4558333 specification and U.S. Pat. No. 4459600 specification which indicate the configuration arranged to the field to which the heat operation section other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of a delivery which is indicated by each above-mentioned specification, a liquid route, and an electric thermal-conversion object is crooked as a configuration of a recording head. In addition, the effectiveness of this invention is effective also as a configuration based on JP,59-138461,A which indicates the configuration whose puncturing which absorbs the pressure wave of JP,59-123670,A which indicates the configuration which uses a common slit as the discharge part of an electric thermal-conversion object to two or more electric thermal-conversion objects, or heat energy is made to correspond to a discharge part. Namely, no matter the gestalt of a recording head may be what thing, it is because it can record now efficiently certainly according to this invention.

[0067] In addition, this invention is effective also when the thing of a serial type like an upper example also uses the recording head fixed to the body of equipment, the recording head exchangeable chip type to which the electric connection with the body of equipment and supply of the ink from the body of equipment are attained by the body of equipment being equipped, or the recording head of the cartridge type with which the ink tank was formed in the recording head itself in one.

[0068] Moreover, since the effectiveness of this invention can be stabilized further, it is desirable to add the recovery means against a recording head formed in this invention as a configuration of a recording device, a preliminary auxiliary means, etc. If these are mentioned concretely, it is effective in order to perform record stabilized by performing the preheating means by the capping means, the cleaning means, the pressurization or the suction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and auxiliary discharge appearance mode in which the regurgitation different from record is performed.

[0069] Furthermore, in addition, in this invention example explained above, although ink is explained as a liquid What is ink solidified less than [a room temperature or it], and is softened or liquefied at a room temperature, Or by the ink jet method, since what carries out temperature control is common as a temperature control is performed for ink itself within the limits of 30 degrees C or more 70 degrees C or less and it is in the stabilization regurgitation range about the viscosity of ink, ink should just make the shape of liquid at the time of use record signal grant. In addition, it carries out whether the ink which prevents by making the temperature up by heat energy use it positively as energy of the change of state from a solid condition to the liquid condition of ink, or is solidified in the state of neglect for the purpose of antifrashing of ink is used. Anyway, ink liquefies by grant according to the record signal of heat energy. This invention can be applied also when using the ink of the property begun and liquefied with heat energy, such as that by which liquefied ink is breathed out, and a thing which it already begins to solidify when reaching a record medium. The ink in such a case is good for a porosity sheet crevice or a through tube which is indicated by JP,54-56847,A or JP,60-71260,A also as liquefied or a gestalt which counters to an electric thermal-conversion object in the condition of having been held as a solid. In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0070] Furthermore, in addition, as a gestalt of this invention ink jet recording device, although used as an image printing terminal of information management systems, such as a computer, the gestalt of combination reproducing units, such as others and a reader, and the facsimile apparatus which has a transceiver function further may be taken.

[0071]

[Effect of the Invention] Since the storing location to the storing means of a picture signal is controlled as mentioned above by setting up the information according to the amount of gaps of the dot location recorded by the record component of each color according to this invention, degradation of the image grace by color gap and resolution fall can be mitigated, and it becomes possible to perform good image recording.

[Translation done.]